National Weather Service Des Moines' Newsletter

THE WEATHER WHISPER

Spring 2014

NWS Des Moines Electronic Systems Analyst David Reese Retires

by Aubry Bhattarai, Journey Forecaster

In January, the National Weather Service in Des Moines said good-bye to Electronic Systems Analyst (ESA) David Reese as he retired after over 35 years of federal civil service. David was the ESA in Des Moines for 11 years, arriving in 2002. David also served in the US Air Force in both active duty and reserve forces for 38 years.

David began his career in the Air Force at Warner Robins Air Force Base in Georgia working in flight facilities equipment repair. After leaving active duty, he then became a member of the US Air Force Reserves; David continued to work for the Department of Defense working on radar and instrument repair on F4 and F-16 fighter jets at Wright Patterson Air Force Base in Ohio. David finished his work with the Department of Defense as the Instrumentation Services Branch Chief with the 4950th Test Wing at Wright -Patterson before beginning work with the National Weather Service. David began working for the National Weather Service as an electronics technician in 1992 at the National Reconditioning Center in Kansas City, Missouri where he also served as a member of the Missouri Air National Guard. Before moving to Iowa, David spent eight years in Missoula, Montana as an electronics technician, where he also served in the Montana Air National Guard.

During his career David also continued his education, studying electrical engineering, avionic engineering and computer science, as well as German. He also spent over 20 years assisting with various Boy Scout Troops. During retirement, David and his wife Kimberly look forward to working around home, on arts, spending time with family and traveling the world, including a trip to Germany to meet relatives and further his German language education. David says his biggest regret is losing touch with several friends, and offers the advice, "work hard, play hard, do it with all your might, and stay in touch with your friends and family." Thank you for your service David! We wish you all the best in retirement!

Jeff Johnson, Acting Meteorologist-In-Charge, Des Moines presenting David Reese, Electronic Systems Analyst his NOAA retirement plaque.

IN THIS ISSUE

Weather-Ready Nation: Saving Lives and Livelihoods

Editors

Ken Podrazik
Aubry Bhattarai

Cover photo courtesy of Kevin Skow

Note from David Reese:

"It has been an honor and pleasure working with so many great people at every location that I have been in my life. I have literally worked with thousands of people in my military, private, and civilian careers. Everyone has made an impact in my life that has made me who I am today. It is time to now start working for myself for a change. It is with great pride and honor that I salute each of you that I have had the pleasure of working with and knowing. I am proud to be an American citizen, a military veteran of Vietnam, and Desert Storm, a father of 3 wonderful children and grandfather of 7. I hope that in some way I have had a positive influence in your life and wish all of you the best of everything! Thanks for the opportunities and memories." –David

Climatological Data for December 2013 through April 2014

Location	Month	Average Temp	Departure	Highest	Lowest	Rain / Snow	Departure
Des Moines	Dec	21.1°F	-4.9°F	54°F (2nd)	-14°F (24th)	0.81" / 13.6"	-0.61" / +4.6"
	Jan	29.4°F	-1.6°F	53°F (19th)	-12°F (6th)	0.50" / 7.5"	-0.50" / -1.01"
	Feb	18.3F	-9.1°F	55°F (18th)	-10°F (10th)	1.84" / 19.4"	+0.56" / +11.5"
	Mar	34.7°F	-4.7°F	78°F (31st)	-7°F (3rd)	0.63" / 5.6"	-1.67" / +0.4"
	Apr	51.4°F	-0.3°F	86°F (12th)	23°F (1st)	4.78" / 0.8"	+0.92" / -1.0"
Mason City	Dec	13.8°F	-5.8°F	42°F (28th)	-16°F (24th)	1.24" / 14.9"	0.00" / M
	Jan	9.0°F	-6.9°F	44°F (19th)	-21°F (3rd, 6th)	0.83" / 9.2"	+0.01" / M
	Feb	8.5°F	-12.2°F	42°F (19th)	-20°F (11th)	2.19" / 20.5"	+1.19" / M
	Mar	26.3°F	-6.7°F	66°F (30th,31st)	-15°F (3rd)	1.21" / 6.9"	-1.02" / M
	Apr	44.0°F	-2.7°F	76°F (19th)	18°F (15th)	7.48" / 5.0"	+3.73" / M
Waterloo	Dec	14.7°F	-7.5°F	45°F (4th)	-21°F (24th)	0.94" / 18.9"	-0.26" / +9.0"
	Jan	10.0°F	-8.5°F	44°F (19th)	-21°F (3rd)	0.66" / 6.5"	-0.17" / -1.7"
	Feb	9.2°F	-14.2°F	43°F (18th)	-25°F (11th)	1.97" / 20.5"	+0.98" / +13.1"
	Mar	28.3°F	-7.5°F	69°F (31st)	-19°F (3rd)	1.51" / 5.8"	-0.55" / +1.2"
	Apr	45.9°F	-3.0°F	83°F (12th)	22°F (15th)	3.71" / 0.4"	+3.53" / -1.4"
Ottumwa	Dec	21.4°F	-4.6°F	51°F (18th)	-19°F (24th)	0.34" / M	-1.03" / M
	Jan	16.6°F	-5.9°F	53°F (12th)	-13°F (6th)	0.12" / M	-0.78" / M
	Feb	16.5°F	-10.6°F	50°F (18th)	-17°F (11th)	1.21" / M	-0.07" / M
	Mar	33.2°F	-5.6°F	72°F (31st)	-9°F (3rd)	0.53" / M	-1.71" / M
	Apr	50.1°F	-0.8°F	84°F (12th)	22°F (15th)	4.78" / M	+1.38" / M

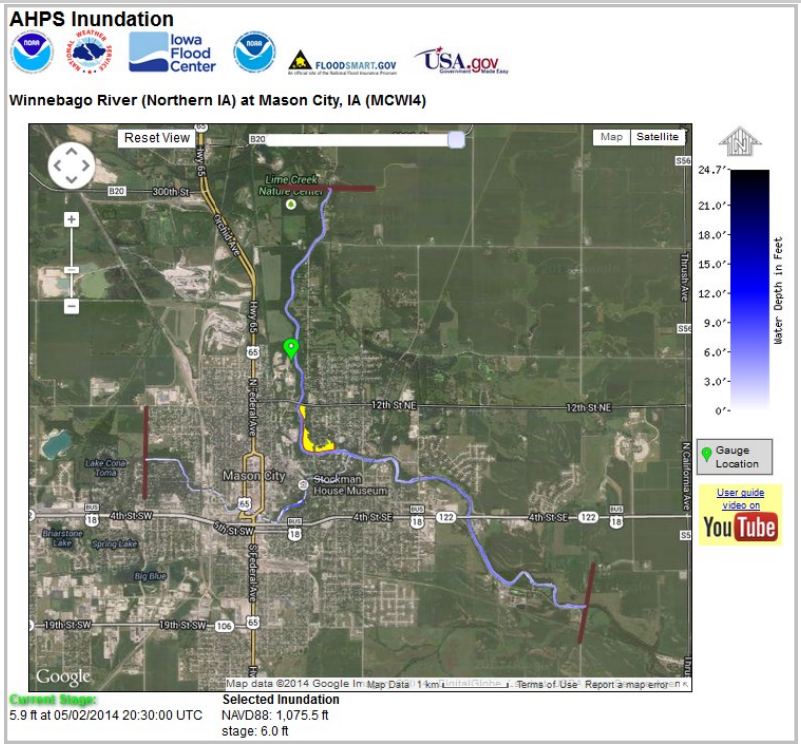
New Flood Preparedness Tool Available for the Mason City Area

by Jeff Zogg, Senior Hydrologist/NWS Des Moines, IA

A dynamic new online flood preparedness tool which will help emergency managers improve flood warnings and response has been developed for the Winnebago River at Mason City, Iowa.

The National Weather Service collaborated with the Iowa Flood Center at the University of Iowa to develop a library of flood inundation maps. The final version of these flood inundation maps is the culmination of a partnership between the Iowa Flood Center (IFC), the Cerro Gordo County Emergency Management Agency, the NOAA Central Region – Regional Collaboration Team and the National Weather Service (NWS). This capability will help communicate the residual flood risks for areas behind the city's levee and the additional flooding from Willow Creek, a tributary to the Winnebago.

Because this new tool is so critical during floods, it is available from two sources. The first source is the NWS Advanced Hydrologic Prediction Service (AHPS) Web site. On the AHPS page for the Winnebago River at Mason City, click on the tab near the top of the page named "Inundation Mapping." The direct link is http://water.weather.gov/ahps2/inundation/inundation_google.php?gage=mcwi4. The second source is the Iowa Flood Center's Iowa Flood Information System (IFIS). The direct link is http://ifis.iowafloodcenter.org/ifis/en/. Go to the Flood Maps section on the right hand side of the page and select Mason City.



Flood inundation maps help people visualize the potential extent of flooding at various river levels. The development of the Mason City flood inundation maps was a team effort which resulted in valuable tools for people in the Mason City area. Many people worked together to make these maps available. The NWS especially appreciates the involvement of emergency management and public works officials in the Mason City area. These maps will help the NWS provide enhanced decision support services to people there.

Dr. Nathan Young, Associate Director of the Iowa Flood Center, said the IFC has been developing flood inundation maps since the IFC's inception in 2009. "This is an opportunity for us to apply research that is useful and meaningful for Iowans," he said. "These detailed maps demonstrate the extent of the flooded landscape with every twelve-inch rise in the flood level. We believe this information will empower communities and individuals to make informed decisions about their flood risks."

Steve O'Neil, Director of the Cerro Gordo County Emergency Management Agency, said that the flood inundation maps will be valuable for multiple reasons. "The flood inundation maps will be a great asset for Cerro Gordo County Emergency Management for long range planning for our communities. They will also be invaluable for Risk Management decisions to anticipate possible trouble areas early on in flood incidents which will allow us to make sound decisions regarding evacuations or locations for defensive flood fight tactics. Overall a very useful tool for the emergency management toolbox."

The Mason City flood inundation maps are based on observations and forecasts involving readings from the U.S. Geological Survey (USGS) stream gage along the Winnebago River at Mason City. More information about USGS streamgaging in Iowa is available on the USGS Iowa Water Science Center Web site at http://ia.water.usgs.gov/.

NWS Des Moines Hosts Media Workshop *by Jim Lee, Journey Forecaster*

From Left: Jim Lee (NWS), Kevin Skow (NWS), Chris Conoan (WOI-ABC 5), Craig Cogil (NWS), Megan Salois (WHOTV), Jennifer McDermed (WHOTV), Sam Schreier (ABC 5), Jeriann Ritter (WHOTV), Jason Parkin (Great Day), Wes Callison (KCCI), Chris Kuball (KAAL-ABC 6), Aubry Bhatarrai (NWS), Brad Small (NWS).

On April 23, the National Weather Service Des Moines office hosted its 2014 Media Severe Weather Workshop. Such events are held about once every year and a half and are designed to facilitate discussion on various warning and forecast developments and means of conveying critical weather information to the public. The 2014 workshop was attended by television meteorologists from around central and northern Iowa and even southern Minnesota. Topics of discussion included new Doppler radar advancements, a review of recent and historical severe weather events in Iowa, warning strategies and new features of warning products, and methods for relaying severe weather information to the public in a timely and accurate manner. We are very proud of our excellent relationship with local media outlets and our strong partnership will enhance the safety of all central Iowans.

Decatur County Hospital Recognized as a StormReady® Supporter

by Jeff Johnson, Acting Meteorologist-In-Charge

Officials from NOAA's National Weather Service recognized the Decatur County Hospital on December 19, 2013 as a StormReady® Supporter. The Decatur County Hospital joins seven other Iowa agencies or businesses as a StormReady® Supporter.

"StormReady® Supporters take a new, proactive approach to improving hazardous weather operations, response and preparedness," said Jeff Johnson, Acting Meteorologist-In-Charge at the National Weather Service Forecast Office in Des Moines, IA.

The program is voluntary and provides businesses and groups with clear-cut advice from a partnership between local National Weather Service forecast offices and state and local emergency managers. To be recognized as a StormReady® Supporter, a business or group must:

- Establish a 24-hour warning point and emergency operations center.
- Have more than one way to receive severe weather forecasts and warnings and to alert the public.
- Create a system that monitors local weather conditions.
- Promote the importance of public readiness through training and seminars.
- Develop a formal hazardous weather plan, which includes specific instructions and protocols in responding to different severe weather hazards .

Des Moines National Weather Service Acting Meteorologist-In-Charge Jeff Johnson presented Safety Coordinator Tory Armstrong with a framed StormReady® Supporter certificate at the Decatur County Hospital on December 19, 2013.

NOAA and the National Weather Service are dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and information service delivery for transportation, and by providing environmental stewardship of the nation's coastal and marine resources.

From left to right - Jeff Johnson, Acting Meteorologist-In-Charge, Des Moines, IA and Lynn Milnes, CEO, Troy Armstrong, Safety Coordinator/AEMT, Jo Beth Smith, CSS, and Kevin Frost, Ambulance Director/Paramedic all of Decatur County Hospital.

Outlook for Summer into Early Fall *by Miles Schumacher, Senior Forecaster*

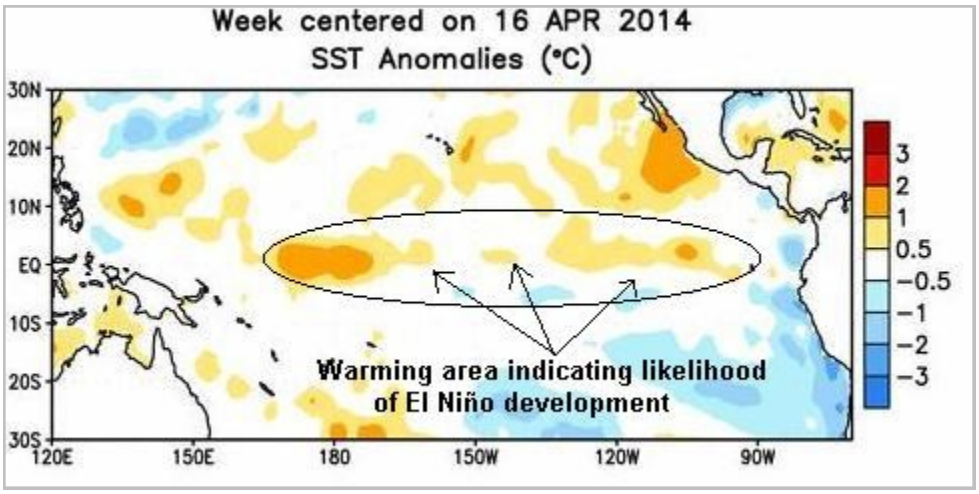
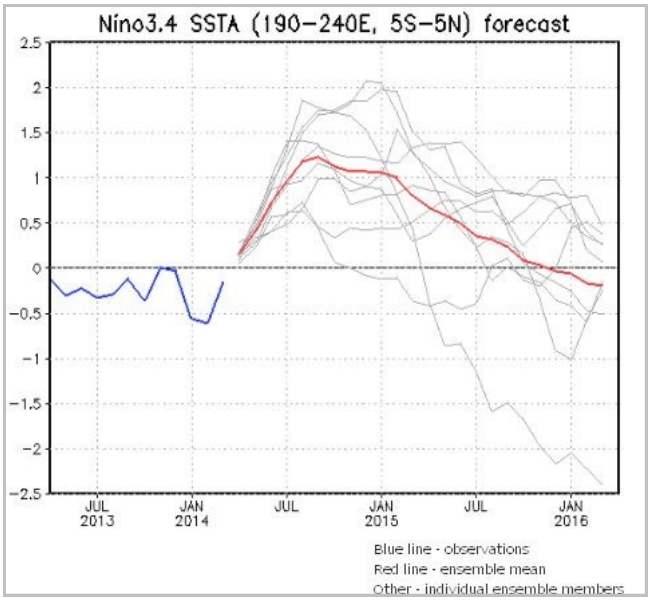


Figure 1: Sea surface temperature departure from normal, equatorial Pacific.

The winter of 2013-14 turned out to be a cold and snowy winter. Temperatures remained below normal through the entire winter with only brief warming periods. The persistent weather pattern is fairly typical of a La Niña pattern. During this past winter a full blown La Niña was not present, however, the area of cooler than normal water present along the equatorial Pacific and a very warm pool of water in the Gulf of Alaska dominated the atmospheric pattern. The winter was expected to be cooler than normal over the northern Plains into at least northern Iowa. The intensity of the cold was greater than expected.

The state of temperatures of the equatorial Pacific Ocean has generally remained cooler than normal for much of the past three years. The prevailing state of the atmospheric circulation has been more like what would be expected with La Niña through much of this time. The La Niña type temperature state has been partially responsible for the hot and dry summers the past two summers. The weather patterns are likely to undergo changes as the state of temperatures in the equatorial Pacific are warming quite rapidly. The circled area in figure 1 shows the overall warmer than normal temperatures along the equatorial Pacific. The warming is likely to continue through the summer and into the fall season.

The atmosphere typically follows a three to seven year cycle between El Niño and La Niña. Depending on the phase of the Pacific Decadal Oscillation (PDO), El Niño is favored during warm phase of PDO, while La Niña is favored during cold phase. The Pacific is currently in the cold phase of PDO. La Niña conditions are favored by a two to one margin during the cold phase. The reason for that change is that during the warm phase of PDO, El Niño typically lasts 10 to 12 months. In contrast, during the warm phase of PDO, it will persist for 20 to 22 months. Many of the models worldwide suggest the development of El Niño this summer into the upcoming Boreal winter. Below is a set of forecasts of equatorial Pacific temperature departures from the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), see figure 2 below. Note the cooling after about one year, leading to a cool equatorial Pacific by late 2015 into 2016. The cooling is expected during the cold phase of PDO, as was the case during the last cold phase of the PDO, roughly from 1947-1977. Model forecasts suggest the sea surface temperature (SST) pattern across the equatorial Pacific is likely to warm rapidly into this summer and actually peak before next winter, before cooling to normal or below by the fall of 2015. For SST departures to be considered either an El Niño or La Niño, the average temperature departure must be at least 0.5°C above or below normal, respectively, or more for three consecutive 90 day seasons.



Although in meteorology no two years are the same strictly speaking, one can look at weather patterns of the recent past to give some indications of near term weather trends in the future. This forecast is based in large part on the best fit from several of the years that were the most similar to last winter and the spring season thus far. Considerations were also made for the state of the Pacific and the expected change to an El Niño state as well as other factors that influence the weather pattern.

(Continued on page 6)

Figure 2: Sea surface temperature departure for the past eight months plotted in blue. The forecasts for the next two years follow. The red line indicates the mean of the nine forecasts made through February of 2016. The gray lines are the individual model runs. Departure in degrees C is shown on the ordinate, with time on the abscissa.

Outlook Continued…

(Continued from page 5)

The Pacific SST's are yielding a signal for the upcoming summer season into the early fall. There are several factors to consider in addition to the statistical factors. The extent of the western U.S. drought is one such consideration as that favors warmer and drier conditions if it persists. The near record cold temperatures of the Great Lakes will affect the weather pattern to some extent as well. The signal from the drought is counter to the statistical signal from the likely El Niño development. It is likely that the El Niño signal will be more dominant. The main reason is that during El Niño summers it is more likely that the southwest U.S. Monsoon will be stronger, bringing relief from the drought over the Rockies and High Plains.

With the expected development of El Niño, there is a greater likelihood for the summer to be cooler and wetter than the past two summers. Much will depend on where the storm track becomes established. The cold water in the Great Lakes will likely favor cold air masses to penetrate southwest as far as northeast Iowa into the early part of the summer. The cold lakes will affect not only temperature, but precipitation patterns as well. Northeast Iowa is expected to average slightly below normal and a little drier than normal. The southwest is likely to average a little above normal with the likelihood of above normal rainfall across the south as the very humid air is expected to be suppressed to the south of normal as well. See figure 3 for details.

There are indications that temperatures will turn warmer than normal later in the summer. August is most likely to become warmer than normal. Rainfall in August is more likely to be short of normal as the southward shift in the jet stream is delayed.

Looking ahead toward the fall, it is common in years with El Niño present for the temperatures during the fall season in the central U.S. to average cooler than normal. This fall is expected to start out cooler than normal with September likely to be a reversal of the expected warm August. Rainfall during September is more likely to be above normal as the jet stream settles back south across the state in early September instead of beginning to move south in August. See figure 4 for details.

It will be important to monitor the oceanic and atmospheric patterns over the next several months. Although the signs point more toward a cooler and wetter summer than the past two summers, failure of El Niño to materialize would have a significant effect on expected winter temperatures.

These outlooks are based more heavily on statistics than many of the methods used by the Climate Prediction Center. The complete set of official forecasts from the Climate Prediction Center can be found on our website.

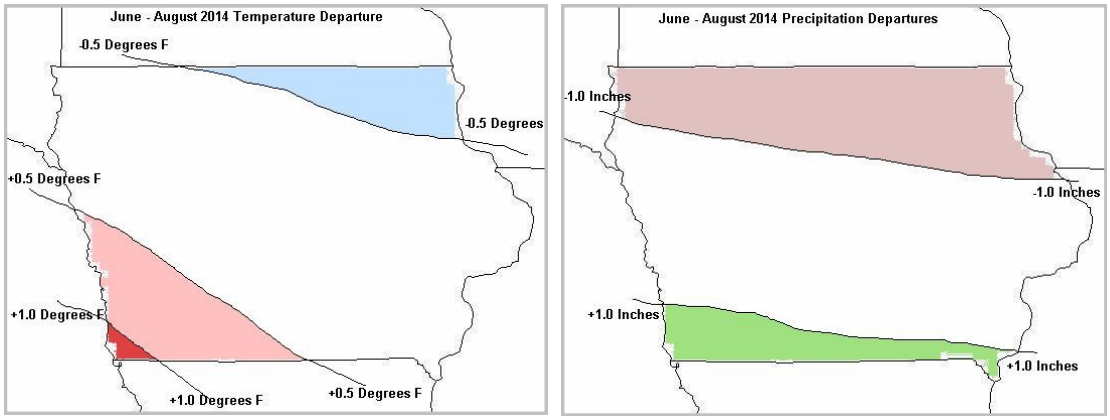


Figure 3: Mean temperature (left) and precipitation (right) departure for June of 2014 through August of 2014.

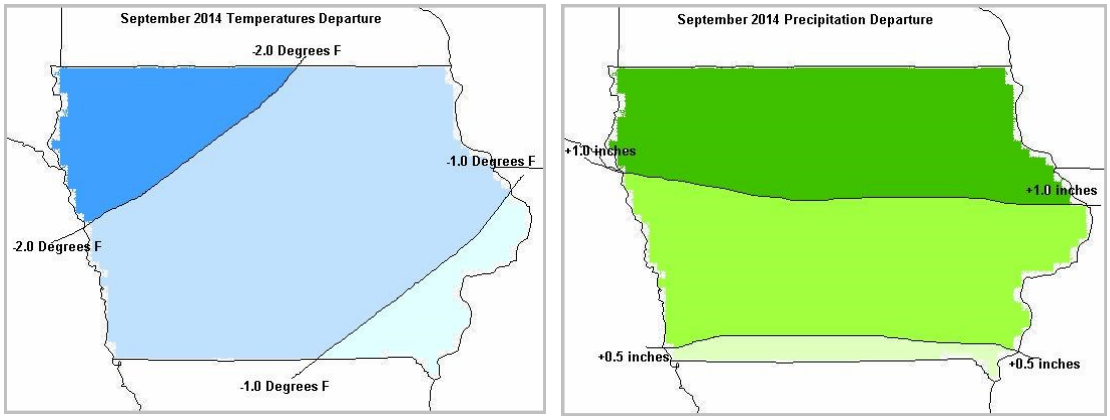


Figure 4: Mean Temperature (left) and precipitation (right) departure forecast for September of 2014.

NWS Des Moines Meteorologist Participates in FIRST® LEGO® League Championship *by Ken Podrazik, Journey Forecaster*

An international program, created by the organization FIRST® in conjunction with LEGO®, known as the FIRST® LEGO® League is held at regional, state, and international levels each year. The Iowa FLL® State Championship Program was held at the Iowa State University College of Engineering Building on Saturday, January 18, 2014.

The FLL® is a competition geared towards ages 9 to 14 to inspire creativity, instill team work, and have fun. A new theme, derived every year, is released by FIRST® that engages FLL® teams in scientific research and hands-on robotic design. The theme for 2013 was Nature's Fury, and the FLL® was eager to seek a NWS meteorologist to help judge the competition. I was fortunate to have the opportunity to be a project judge for this fascinating event.

The competition consisted of 2 to 10 membered teams and the teams were challenged to focus on a problem related to Nature's Fury. They needed to determine a problem and come up with a specific solution related to Nature's Fury. For instance, if there was a problem with flash flooding in their local community, the team would then need to create an original solution to mitigate the flash flooding issue. The teams then had 10 minutes to present their problem and solution to a set of volunteer judges.

The volunteer judges that participated came from all facets of science related industries. The competition was scored on 3 main categories; project, core values, and robot. Each category was broken down into specific skill sets. The project judging included research, innovative solution, and presentation. However, the first 2 where only counted in the team's final project score.

A rubric (see below) was provided to us, the judges, to aid our evaluation of each team's accomplishments within the 3 aforementioned skill sets. We were to judge teams on their ability to clearly identify the problem and their sources of information. Our evaluation also included how extensively the team studied and analyzed their problem and existing solutions to their current problem. We judged the innovative solution skill area on how well the teams included a clear explanation of their solution, the degree of innovativeness, and whether they considered the implementation factors.

In addition to the project challenge, the teams were also tasked to create a robot from scratch made completely of LEGO® pieces, including utilizing LEGO® Mindstorms robotics kits. Even though the robots were entirely self-sufficient or not remote controlled, the teams would put their robots to the test in a series of challenges in 3 separate matches. The single best score of the 3 matches is the score they kept.

It was a highly successful event as there were over 4000 people in attendance with around 700 youth across Iowa participating in the event. There were 36 awards given after about 8 hours of competition.

⇒ http://www.firstlegoleague.org/
⇒ https://www.isek.iastate.edu/files/2013/01/2013-FLL-Championship-Program-FINAL.pdf
⇒ http://www.usfirst.org/roboticsprograms/fll
⇒ http://www.usfirst.org/aboutus/first-the-lego-foundation-and-lego-education-announce-graduation-grants-available-to-frc-teams

FLL FIRST® LEGO® League

Project Team Number Judging Room

Directions: For each skill area, clearly mark the box that best describes the team's accomplishments. If the team does not demonstrate skill in a particular area, then put an 'X' in the first box for Not Demonstrated (ND). Please provide as many written comments as you can to acknowledge each team's hard work and to help teams improve. *When you have completed the evaluation, please circle the awards for which you would like this team to be considered.*

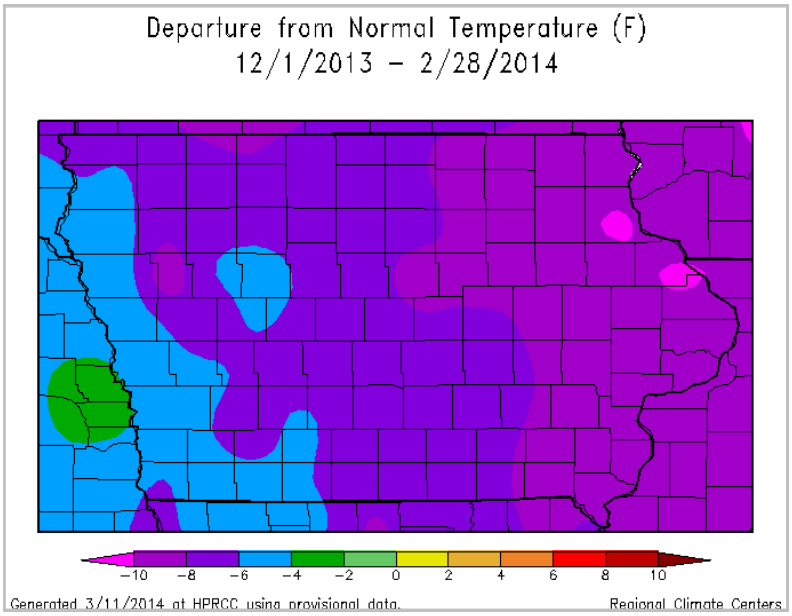
		Beginning	Developing	Accomplished	Exemplary
Research	**Problem Identification** * Clear definition of the problem being studied				
	ND	unclear; few details	partially clear; details missing	mostly clear; detailed	clear; very detailed
	Sources of Information Types (e.g. books, magazines, websites, reports and other resources) and number of quality sources cited, including professionals in the field				
	ND	one type of information cited; minimal sources	two types of information cited; several sources	three types of information cited; many sources, including professionals	four(+) types of information cited; extensive sources, incl. professionals
	Problem Analysis Depth to which the problem was studied and analyzed by the team				
	ND	minimal study; no team analysis	minimal study; some team analysis	sufficient study and analysis by team	extensive study and analysis by team
	Review Existing Solutions Extent to which existing solutions were analyzed by the team, including an effort to verify the originality of the team's solution				
	ND	minimal review; no team analysis	minimal review; some team analysis	sufficient review and analysis by team	extensive review and analysis by team
Comments:					
Innovative Solution	**Team Solution*** Clear explanation of the proposed solution				
	ND	difficult to understand	some parts confusing	understandable	easy to understand by all
	Innovation Degree to which the team's solution makes life better by improving existing options, developing a new application of existing ideas, or solving the problem in a completely new way				
	ND	existing solution/application	solution/application contains some original element(s)	original solution/application	original solution/application with the potential to add significant value
	Implementation Consideration of factors for implementation (cost, ease of manufacturing, etc.)				
	ND	minimal factors considered	some factors considered	factors well considered; some question about proposed solution	factors well considered and feasible solution proposed
Comments:					
Presentation	**Sharing*** Degree to which the team shared their Project before the tournament with others who might benefit from the team's efforts				
	ND	shared with one individual	shared with one group	shared with one individual or group who may benefit	shared with multiple individuals or groups who may benefit
	Creativity Imagination used to develop and deliver the presentation				
	ND	minimally engaging OR unimaginative	engaging OR imaginative	engaging AND imaginative	very engaging AND exceptionally imaginative
	Presentation Effectiveness Message delivery and organization of the presentation				
	ND	unclear OR disorganized	partially clear; minimal organization	mostly clear; mostly organized	clear AND well organized
Comments:					

Awards Consideration: Research Innovative Solution Presentation

*Required for Award Consideration

Iowa Statewide Climate Summary for Winter 2013-14

by Craig Cogil, Lead Forecaster

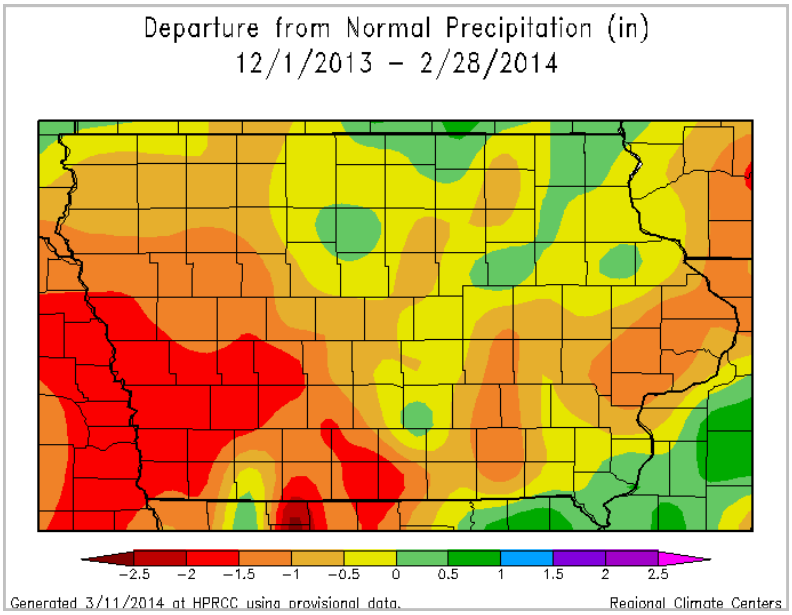


Temperatures:

This past meteorological winter (December-February) will go down as one of the coldest in recent memory. Cold weather was persistent across the state and much of the Midwest for the period with this cold weather continuing into the early Spring as well. Statewide average temperatures averaged 14.6 degrees which was 7.5 degrees below normal for the winter. This was the 9th coldest winter on record across the state and was the coldest for Iowa since the winter of 1978-79. The cold conditions allowed deep penetration of frost into the soil with some locations reaching over three feet deep. Water main breaks became common across the state along with septic system freeze-up occurring. The ground remained frozen into the spring with frost finally departing from soils in portions of northern Iowa by the middle of April.

Precipitation:

Precipitation was generally below normal across the state through the winter with southwest Iowa seeing the least amount of precipitation compared to normal. For the state as a whole, total precipitation for the winter averaged 2.61 inches or 0.73 inches less than normal. This was the driest winter since 2005-06 and was the 42nd driest winter on record in the state. The dry conditions continued into the month of March which ended up being the 11th driest on record as well. There has been some recent improvement in April with several storm systems bringing beneficial rains across the state.

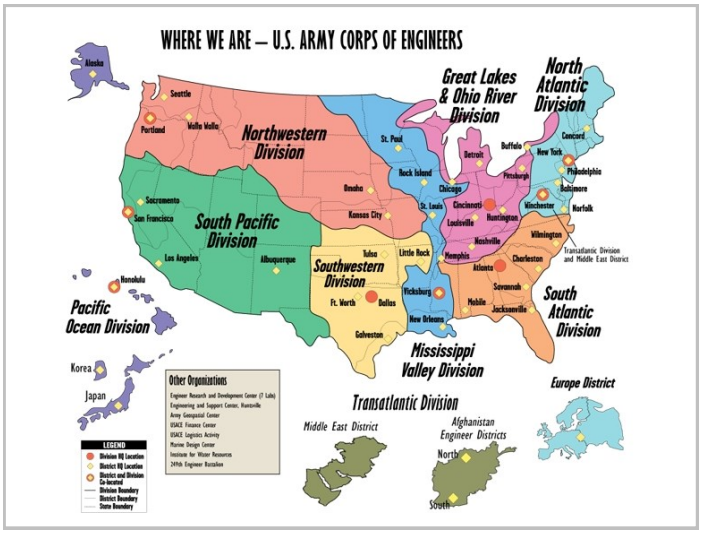


Month	Temperature	Departure from Normal	Rainfall	Departure from Normal	Temperature Ranking	Precipitation Ranking
December 2013	17.3°F	-5.6°F	0.64"	-0.71"	17th Coolest	30th Driest
January 2014	13.9°F	-5.5°F	0.43"	-0.49"	35th Coolest	19th Driest
February 2014	12.6°F	-11.4°F	1.54"	+0.49"	7th Coolest	28th Wettest
March 2014	29.3°F	-6.6°F	0.83"	-1.32"	22nd Coolest	11th Driest
Winter 2013-2014	14.6°F	-7.5°F	2.61"	-0.73"	9th Coolest	42nd Driest

Winter includes December-February. Rankings are based upon 142 years of records. The December numbers cover the past 141 years. All values are preliminary.

Where Does River Level and Streamflow Data Originate?

by Jeff Zogg, Senior Hydrologist/NWS Des Moines, IA



Map of U.S. Army Corps of Engineers Divisions and Districts. Credit: U.S. Army Corps of Engineers

Introduction

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. The average annual inflation-adjusted flood losses for 2001 through 2010 were $10.2 billion. Iowa ranks #2 in the United States for flood-related losses over the long term. In addition, over three-fourths of all Presidential disaster declarations involving Iowa have been either fully or partially due to flooding.

The National Weather Service places a high priority on timely and accurate flood warnings and forecasts in Iowa. These warnings and forecasts can help people take measures to mitigate flood-related losses. In order to provide the best possible river flood warnings and forecasts, however, the NWS must know what the river is doing in real-time before a confident warning or forecast can be provided. In addition, long-term, accurate data records are needed so that the NWS can calibrate its river forecast models.

In Iowa, the NWS relies on several partners to measure river levels and streamflows and provide that data in real-time. From a statewide perspective, the largest NWS streamgaging partners are the U.S. Geological Survey, the U.S. Army Corps of Engineers and the Iowa Flood Center. Other partners include several local communities. This article will focus on the U.S. Army Corps of Engineers. An article in the previous *Weather Whisper* newsletter featured the U.S. Geological Survey. Articles in future newsletters will focus on other partners.

U.S. Army Corps of Engineers

The mission of the U.S. Army Corps of Engineers (USACE) is to "Deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters." The USACE is part of the U.S. Department of Defense. The history of the USACE can be traced back to June 16, 1775, when the Continental Congress organized an army with a chief engineer and two assistants. Colonel Richard Gridley became General George Washington's first chief engineer; however, it was not until 1779 that Congress created a separate Corps of Engineers.

The USACE is comprised of over 35 Civil Works Districts. Each of these entities has its own focus. In Iowa, the NWS works primarily with the Water Management Section which provides hydrologic, hydraulic engineering and water management expertise in part of the USACE's Civil Works Program. The Water Management Section is responsible for monitoring and regulating four rivers in Iowa: the Des Moines River, Iowa River, Chariton River and Missouri River. It operates four reservoirs in Iowa: Saylorville and Red Rock on the Des Moines River, Coralville on the Iowa River and Rathbun on the Chariton River. The Water Management Section is also responsible for maintaining adequate navigation depths on the Mississippi River.

Geographically, the USACE is divided into nine Divisions. Each Division is further geographically divided into Districts. Typically the Division or District boundaries align with major river basins. Two Divisions serve Iowa: the Mississippi Valley Division comprises the Mississippi River basin portion of Iowa and the Northwestern Division comprises the Missouri River basin portion. Within the Mississippi Valley Division, two Districts serve Iowa—the St. Paul and the Rock Island Districts. Within the Northwestern Division, two Districts serve Iowa—the Omaha and Kansas City Districts.

USACE and Stream Gaging

Many of the Water Management Section's operations and decisions require hydrologic information. As mentioned in a past *Weather Whisper* article about the U.S. Geological Survey (USGS), the two most fundamental items of hydrologic information about a river are river level and streamflow. Those two parameters are also known as stage and discharge respectively.

The USACE directly operates a smaller number of streamgages in Iowa than does the USGS. Most of the gages that are operated by the USACE are located at project sites—or on tributaries to—the aforementioned four streams in Iowa which the USACE regulates. The USACE helps to fund many other gages that the USGS operates. Thus, although the USACE is directly involved in a relatively small number of streamgages in Iowa, it is indirectly involved in many more of them.

(Continued on page 10)

Streamflow Data Continued…

(Continued from page 9)

As with the USGS streamgaging stations in Iowa, many of the USACE stream gaging stations automatically measure stage and compute discharge at a 15-minute interval and report the data in real-time to the NWS and on public Web pages. The real-time reporting equipment allows for the river stage to be remotely monitored. Linking battery-powered stage recorders with satellite radios enables transmission of stage data to the NWS and public Web sites even when the power goes out due to floods and other kinds of severe weather.

Although both stage and discharge are important elements, the NWS river forecast models work with discharge not stage. The model output is in discharge but is converted to stage to help facilitate easier understanding by NWS partners and users. The model input must also be discharge. The rating curve is a graphical representation that relates discharge to stage and allows the NWS and other users to determine the discharge based on reported stage. Since the USACE operates relatively few streamgages in Iowa, it typically partners with the USGS to develop and maintain rating curves for many of its streamgages by measuring discharge.

Aerial photo of Saylorville Dam along the Des Moines River. The dam is located 9 miles (or 12 river miles) north-northwest of downtown Des Moines. Credit: U.S. Army Corps of Engineers.

USACE-NWS Partnership

The USACE is a valuable partner of the NWS. The missions of both agencies seek to protect our Nation from natural disasters and to encourage preparedness. Since the operations of the four USACE reservoirs in Iowa can significantly impact the streams on which they are located, the USACE and NWS coordinate their operating and forecasting activities. These activities include sharing river and rainfall data as well as related ideas and concerns. Although most of this coordination is routine, it can be increased as needed before, during and after flood events. USACE and NWS personnel are accessible to each other after hours if necessary. The coordination is mutually beneficial to both the USACE and NWS. The USACE is able to make more informed decisions regarding its activities and the NWS can make more informed decisions regarding its river forecasts and related flood warnings. The end result is that the Federal Government can provide more accurate and timely flood warning and forecast services to the Nation.

The Future

As with the NWS-USGS partnership, the NWS-USACE partnership is expected to continue well into the future. The demand for NWS river flood warning and forecast services is expected to continue growing due to expanding population, urbanization and economic growth. Although new radar technologies and computer visualization techniques hold significant promise for improving the timeliness and accuracy of river flood warnings and forecasts, coordination between both agencies will continue to be needed. By working together, the NWS and USACE can help each other achieve their missions of protecting and preparing our Nation for flood events.

Thank you to Jim Stiman, Chief of the USACE Rock Island District, Water Management Section for his contributions to this article.

US Army Corps of Engineers®

Resources

NWS Hydrologic Partners. http://water.weather.gov/ahps/partners/nws_partners.php
Brief History of the USACE. http://www.usace.army.mil/About/History/BriefHistoryoftheCorps.aspx
USACE National Headquarters. http://www.usace.army.mil/
USACE RiverGages river data Web site. http://www.rivergages.com/

We want your feedback! We want to hear about your favorite stories and features, or if there is something you would like to see in an upcoming issue, let us know! Contact the editors at: Kenneth.Podrazik@noaa.gov or Aubry.Bhattarai@noaa.gov

Storm Interrogation

N	O	N	O	V	X	O	O	G	B	M	H	O	D	O	G	R	A	P	H
F	O	P	M	J	F	X	I	D	E	W	P	O	I	N	T	D	E	G	N
X	D	G	R	A	D	A	R	O	B	E	P	V	E	L	O	C	I	T	Y
L	Y	E	N	V	F	S	O	U	N	D	I	N	G	Z	O	L	B	O	B
Y	Y	F	F	D	Z	T	L	J	Z	E	S	Q	P	W	P	A	N	P	U
M	H	K	R	Y	C	C	C	C	U	Y	X	H	Z	P	R	D	M	C	L
U	Z	Q	U	A	C	O	N	V	E	R	G	E	N	C	E	O	Y	C	K
L	U	S	C	I	R	F	Z	A	P	L	K	C	U	E	A	U	L	Y	S
C	I	R	C	U	L	A	T	I	O	N	M	C	R	T	R	D	R	L	H
S	V	O	R	T	I	C	I	T	Y	F	Q	U	P	C	I	O	W	I	E
T	B	F	H	R	F	G	V	X	F	Q	T	V	L	O	N	L	E	P	A
L	A	G	Z	O	D	K	M	L	L	A	C	G	S	U	F	C	A	S	R
Z	D	F	V	S	A	Q	Z	L	R	H	Z	R	A	P	L	A	K	I	F
T	J	L	H	Q	K	B	E	E	J	N	R	E	T	L	O	P	E	A	W
B	Y	Z	Z	B	E	C	P	C	E	E	Q	F	E	E	W	E	C	R	I
M	Z	K	U	X	R	M	E	C	L	T	X	L	L	T	N	L	H	L	O
E	U	L	H	E	E	R	P	P	L	P	L	E	L	W	O	A	O	J	I
O	Y	L	P	T	U	Y	P	S	W	V	N	C	I	U	T	P	R	S	W
H	D	U	T	T	F	O	G	U	U	C	Z	T	T	K	C	S	E	Z	K
W	S	J	S	I	D	E	N	T	Y	E	X	I	E	L	H	E	G	K	B
J	H	I	J	J	C	L	C	F	O	C	A	V	C	C	I	R	I	A	P
B	O	G	A	D	V	E	C	T	I	O	N	I	Q	B	J	A	O	A	J
M	H	Q	E	L	U	L	L	E	F	F	Z	T	G	D	R	T	N	H	H
H	O	O	K	E	C	H	O	L	S	L	Q	Y	J	T	E	E	L	F	L

ADVECTION
BULKSHEAR
CAPE
CIRCULATION
CONVERGENCE
COUPLET
DEWPOINT
DOPPLER
HODOGRAPH
HOOKECHO
LAPSERATE
MOISTURE
MULTICELL
RADAR
REARINFLOWNOTCH
REFLECTIVITY
SATELLITE
SOUNDING
SUPERCELL
TEMPERATURE
VELOCITY
VORTICITY
WEAKECHOREGION

Answer Key